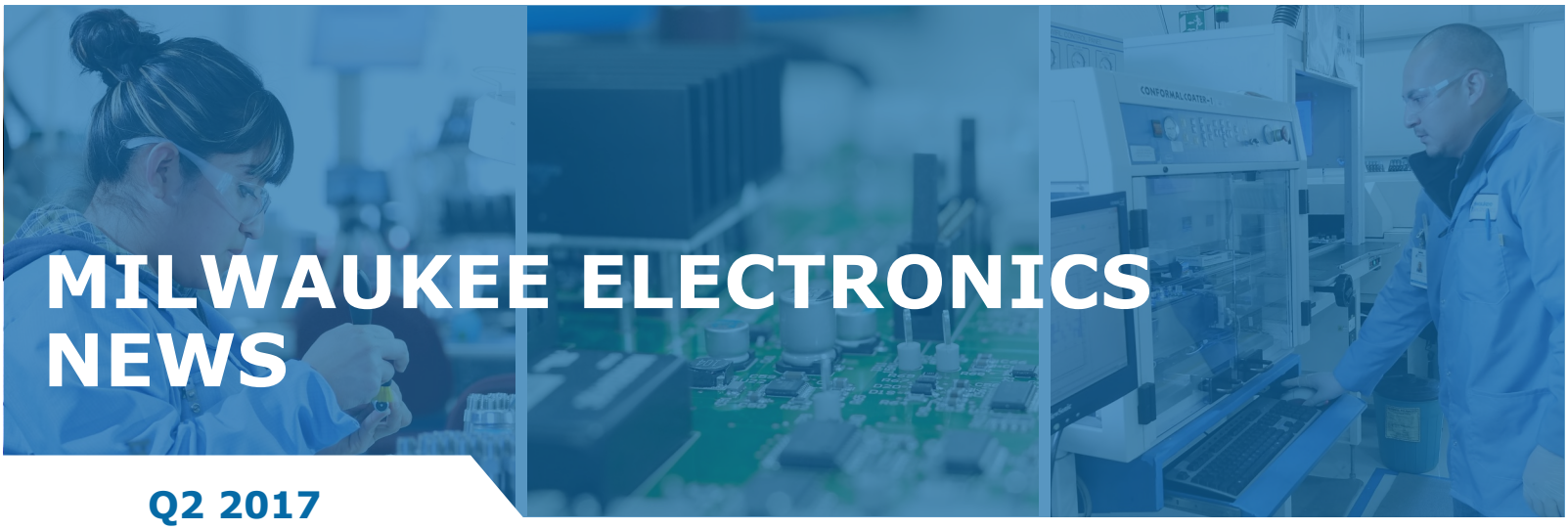

MILWAUKEE ELECTRONICS NEWS

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About Milwaukee Electronics

Milwaukee Electronics designs and manufactures custom circuit board assemblies for the medical, transportation, military, HVAC and a variety of other industries. The Company operates over 135,000 square feet of manufacturing in Portland, Oregon; Milwaukee, Wisconsin; and Tecate, Mexico. In addition to EMS and product design and engineering services, it offers PCB layout services through its San Diego PCB business unit and quick-turn prototyping through its Screaming Circuits business unit.

Milwaukee Electronics™
MANUFACTURING EXPERTS SINCE 1954

Tecate Facility Adds SMT Line

Above, the Tecate facility's newest SMT line in operation.

A new Panasonic NPM SMT line has been installed in Milwaukee Electronics' Tecate facility to add capacity in support of two new programs. The line is identical to the line installed last year and utilizes the same cart system, latest version PanaCIM 10 software and DGS Data Creation System. It includes an Ekra Serio 4000 screen printer, Panasonic NPM-W2 chip shooter, a Pansonic NMP-W2 multi-

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Message from Mike

Growth in new business and the need to keep pace with advanced technology products is driving additional equipment investment in both our Portland and Tecate facilities. Our credo has long been to deliver ***Perfect Product***. One of the challenges every electronics manufacturing services (EMS) company today faces is that of maintaining superior quality in products with increasingly complex leadless components. These components bring unique challenges, and we are investing to keep pace with that.

First, we've added another SMT line in Tecate to support their need for additional capacity. We continue to see strong growth in manufacturing requirements on both sides of the border.

Our investments in new screen printing technology and x-ray inspection capacity help us more quickly set up repeatable processes and verify the results, particularly in relation to the challenges posed by higher pin count BGAs and QFNs. They also provide automated reporting that aligns with customer quality data reporting requirements.

The data from last year's customer satisfaction survey was instrumental in many of the operational improvement investment decisions we've made over the last few months. Our choice of the Aegis Fac-

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Portland Facility Utilizing Lean to Optimize Efficiency

While much of the new equipment that Milwaukee Electronics has purchased during the last year is inherently more efficient, there is a human factor as well. Alex Hughes, who joined the Portland facility as Manufacturing Manager in December has been applying Lean manufacturing principles to ensure the capabilities of the new line are being fully exploited.

The SMT line's software recommends the best feeder placement based on PCBA layout.

"Our SMT line's PanaCIM software makes it easy to generate reports on machine downtime and cycle times. I've set up daily, weekly and monthly reporting. In reviewing those reports, length of changeover time stood out. In some cases, it was running an hour," Alex said.

Alex began his poka-yoke process by talking to the SMT operators and setup people. He found feeder constraints were the biggest issue.

"While we had enough feeders to run our jobs; we didn't always have enough feeders to have the next job step up and ready to move onto the machine as the last job was finishing. In those cases, the team had to wait for the machine to finish and then unload and reload the feeders. I checked with Tecate and found they had extra feeders that they could ship to us, so the problem was solved without having to purchase additional feeders," Alex added.

Another area of improvement was the actual setup process itself.

"Part of the improvement effort was simply setting expectations. I wanted to see our average changeover time get down to 20 minutes. That was a change in mindset for a team that had been used to working with far less efficient equipment," Alex said.

Alex looked at the process for setup in the area. The team had no specifically assigned tasks or an order of process changeover. In some cases, the SMT placement equipment was changed over first and then reflow oven profile was set.

"We needed to eliminate variation in the way we set up and establish a process that addressed critical path issues first. If the reflow oven must cool down for the next job, that typically becomes the gating item on changeover time. So, the setup team now sets the oven profile first. Setup team members have assigned duties and an assigned sequence of tasks," Alex said.

The addition of the new Ekra Serio 4000 has also contributed to improving changeover time, as it is much faster to load to than previous printer.

With the changes in place, changeover time now ranges between 10 and 39 minutes per job. The line's built-in verification process that ensures components and feeders are loaded correctly, will limit how much more time can be eliminated from the changeover process.

However, Alex and his team are not through with improvements yet. The

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Grattan Named Screaming Circuits Product Manager

Margaret Grattan has joined Screaming Circuits as Product Manager. She was previously associated with Rockwell Collins as India Business Relationship Manager. During her nine-year tenure with Rockwell Collins she also served as a project manager, subcontracts engineer and software engineer.

Margaret Grattan

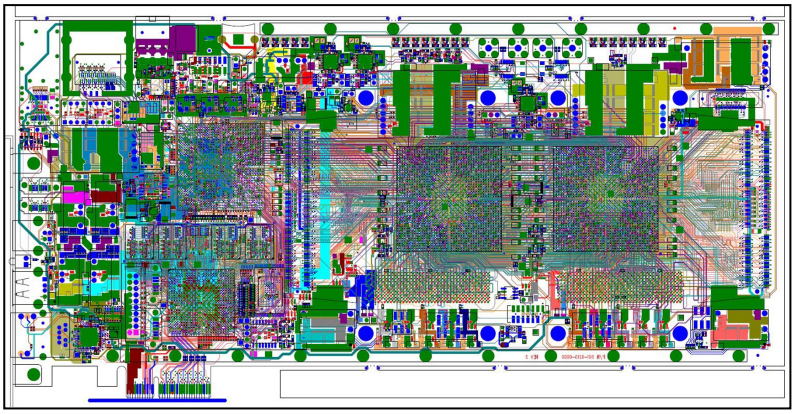
"Milwaukee Electronics has developed great areas of specialty in recent years – Screaming Circuits and San Diego PCB being the best examples. Our opportunity today is to align these targeted services in new ways to add more value to customers. Margaret brings a great mix of technical, process and international experience to our team. She will help us create synergies for customers in new and innovative ways," said Jered Stoehr, Milwaukee Electronics VP of Sales and Marketing.

Margaret received a Bachelor of Science degree in Computer Science from the University of Kansas and a Master of Business Administration degree from the University of Iowa. She is fluent in Spanish.

Engineering in Action

San Diego PCB's Holistic Approach Solves HDI Issues

As products continue to shrink, the engineering layout and manufacturability challenges grow. The laws of physics haven't changed; but the amount of available real estate has shrunk dramatically. Imagine moving from a 2000 sf house to 200 sf apartment. You want to be able have individual spaces to sleep, eat and relax. That requires a major shift in thinking and a much more efficient use of space. It also requires a good understanding unintended consequences as that space shrinks. Your 2000 sf house put outlets far away from running water for safety. The noise of a dishwasher or washing machine was likely not noticeable in the bedroom. Your electrical service was sized to your preferences. However, in the smaller apartment, safety, noise and electrical load considerations must be balanced with available space constraints.



This product is an example of a dense solvability challenge due to its 16 layers and High-Speed (gigabit data transfer) signal requirement. The end layout met signal and electrical integrity requirements and was highly manufacturable.

Printed circuit board (PCB) layout teams have the same challenges when designing high density interconnect (HDI) printed circuit board assemblies (PCBA). Each layer of the PCBA needs to perform as specified in terms of signal and power integrity. However, the increased complexity of having more layers doing more things in less space can create untended consequences that degrade signals or cause the PCBA to overheat.

"When an engineer designs a product, he or she is typically focused on form, fit and function. The details of how the engineering specification translates to PCB layout are typically left to the PCB designer. We call this process solvability, because it involves figuring out how to place and route all parts, signal traces, voltages and ground within the space allotted," said Mike Creeden, VP of Layout Services.

However, simply designing the PCBA to industry-standard guidelines may not be enough.

"It is possible to design a PCBA that meets electrical integrity specifications and the solvability challenge that is a nightmare to manufacture. And, that happens fairly often when the design team works in a vacuum. The more complex the PCBA, the more important it becomes to take a holistic approach that looks at manufacturability or what we call "DFX" along with electrical integrity and solvability. Industry standards provide a strong foundation for DFX, but there may also be equipment constraints at the manufacturer that need to be considered," said Mike.

The team at San Diego PCB addresses the DFX challenge through training and a holistic approach.

"Our designers go through training and are ultimately certified as IPC CID or CID+ Designers. This gives them a much broader understanding of the impact of their design decisions. Being part of Milwaukee Electronics also helps. They have established processes for integrating DFX analysis and recommendations into product development. Instead of taking a siloed approach that divides engineering, layout and manufacturing into completely separate teams, the groups have strong understanding of each other's constraints and work together to implement a cohesive solution," said Mike.

San Diego PCB's holistic focus on solvability, electrical integrity and DFX reduces layout time and helps ensure that Rev 1 works.

Screen Printing and Inspection Capabilities Enhanced

Products across all industries are getting smaller and more powerful. Concomitantly, components are also becoming smaller with more complex interconnections to the printed circuit board (PCB), that can't be verified through standard visual inspection means.

That drives two behaviors from a manufacturing standpoint. First, the entire assembly process must be tightly controlled to minimize the possibility that defects will occur. Second, automated inspection technology must be adequate to easily detect any defects that do occur. Adding to the complexity is the fact that cost pressures continue to increase and the time expectations from order to fulfillment continue to decrease.

To address customer requirements and these trends, Milwaukee Electronics has recently enhanced its screen printing and x-ray inspection capabilities in Portland, OR and Tecate, Mexico.

"Ask any manufacturing engineer and

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New Tecate Program Manager Named

Manuel Fornes

Manuel Fornes has joined Milwaukee Electronics' Tecate facility as a Program Manager. Previously, he was a Program Manager/ Customer Service Manager Autosplice, Inc. in Tijuana. He was earlier associated with The Chamberlain Group and Motorola – Connected Home Solutions in program management supply chain management, engineering and quality engineering roles.

"Manuel brings nearly two decades of manufacturing experience in production facilities with world class technology and processes. His expertise enables him to be both an effective customer advocate in areas where we need to improve our service, and an effective program manager when it is necessary to better fine tune customer forecasts, explain the benefits of our Dfx recommendations or drive collaborative improvement efforts," said Pirouz Pourhashemi, Tecate General Manager.

Manuel received his Bachelor in Electrical Engineering degree from the Instituto Tecnológico de Sonora and his Master in Business Administration degree from the Instituto Tecnológico y de Estudios Superiores de Monterrey. He is a Six Sigma Green Belt and has also completed training in Lean manufacturing and operational excellence. He received Motorola University training in project management.

Message from Mike

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toryLogix as our Manufacturing Execution System (MES) in particular, was driven by the strong feedback given relative the need to increase speed on our manufacturing floor. When fully implemented, we believe it will reduce documentation transfer and programming time on new projects by over 50 percent and provide additional efficiencies in other parts of our manufacturing processes.

Our next customer satisfaction survey will be sent out in the August/September timeframe. If you receive one, I strongly encourage your participation. While we see only the aggregate data, the trends the survey reveals really do help guide our decisions in the investments we make to better support your requirements.

P. Michael Stoehr

President & CEO

Changeover Time

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line's DGS Data Creation System automatically performs line balancing by recommending optimum feeder positions based on component placement requirements. This determination of best sequence of component placement can substantially reduce cycle time, particularly when measured over a month of production.

"Compared with our old line, this optimization literally gives us extra days of capacity. However, we weren't fully exploiting the capability. The new line was purchased with a set number of nozzles for the placement heads. Now that we have a better idea of the production trends on the line, we've been purchasing more nozzles to fully utilize the capacity of the heads," Alex said.

The team is now focusing on its next challenge, which is optimizing the line's ability to automatically do feeder changes when parts run out via a free feeder programming option.

"Improvement should be a continuous process. We've changed the culture of the team from one of 'we are limited by our equipment' to one of 'let's figure out how the best way to capitalize on what our equipment can do'. That opens the door to continuously improving cycle times and is a credit to the ingenuity and dedication of our team," Alex said.

Tecate Equipment

(Continued from page 1)

functional pick-and-place machine and a 10-zone Vitronics Soltec XPM3m reflow oven.

The PanaCIM software can show real-time information on production cycle time, machine performance, operation ratio, placement quantity and production quantity, or be customized to show any information desired. The machine verification (MV) feature in the PanaCIM software automatically checks the feeders in each cart to validate the right parts are present. The DGS system can recommend optimum feeder loading sequences and the best nozzle sizes to minimize placement time.

The facility has also added a Yestech BX automatic optical inspection (AOI) system.

Screen Printers, X-Ray Inspection

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they will tell you that quality starts with solder paste deposition. Environmental factors such as amount of time the solder paste has been exposed to air, shape of the screen apertures, height and "slump" of paste all impact solder joint quality. We wanted to select a screen printer that addressed as many of these factors automatically as possible," said Dan Yantz, NPI/Engineering Manager.

The Ekra Serio 4000 screen printer fit those requirements and more. Operator input is done via touchscreen and is menu-driven. Stencil setup is automated. The printer pulls the stencil in, positions it and locks it in automatically. That feature alone has reduced changeover time from an average of 5 minutes to 30 seconds.

The new screen printer's touchscreen, menu-driven user interface reduces setup and changeover time dramatically.

Programming is also simple and fast. When a PCB is loaded, the machine scans it. The operator touches the fiducial on the board image and the machine automatically sets up the board. The operator hits the "teach" button and the machine stores the parameters for use with every identical board. The operator can also create subroutines that apply the same set of parameters to common board families.

"The ease of setup and operation is important. It means we get a repeatable process and it is much faster than our older machines. And while saving five minutes on stencil setup may not seem significant, when you multiply it times the seven or eight setups we do per day, the savings are substantial," added Dan.

From a process control standpoint, the printer monitors a standard set of parameters such as squeegee pressure and can also be programmed to measure user-specified parameters. The printer contains two 600 gram cartridge dispensers that can dispense automatically via a paste detection system that can be programmed to high and low parameters, or be controlled by the user when throughput is better served by manually programming the amount of paste dispensed. A built-in 2.5D solder paste inspection (SPI) compares the stencil aperture with pad on the PCB and measures solder brick height. The operator simply indicates on the touchscreen, which areas of the PCB should be inspected.

The automatic stencil cleaning system is also enhanced, using a vibratory tool that cleans both X and Y axes.

Sciencescope X-spection 6000 X-ray inspection systems were also purchased for Portland and Tecate. The units have a rotating and tiltable stage enabling operators to get a full 360 degree image of the printed circuit board assembly (PCBA). A digital camera captures the image and converts it to a 3D rendering with no loss of clarity.

"Our customers operate from a trust but verify perspective, particularly with mission critical applications such as medical products that have QFNs or BGAs. They want inspection photos of every first article to validate that the process is delivering the expected levels of solder joint quality, since x-ray is really the only non-destructive option for determining that," Dan said.

The camera operates at higher magnification power than the previous unit, enabling more accurate inspection.

"The images we are getting make it much easier to identify issues. Plus, the systems include a software application that analyses the images. It will automatically calculate the density of the solder brick, pad or ball and provide the volume and amount of voiding. It also measures the radius of all collapsed balls on a BGA, making it easy for us to identify deviations," said Dan.

Inspection time per board has also been substantially reduced. For example, on one board with 15-20 QFNs, inspection time has been reduced from 10 minutes to 1-1.5 minutes, primarily due to the fact that once programmed, the machine automatically rotates the board to capture the required images.

"Adding the latest solder paste printing and x-ray inspection technology has automated a lot of things we did manually. It saves times, improves accuracy and adds features that enable us to better meet customer requirements," Dan said.

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